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The spectre of terrorism and the stock market

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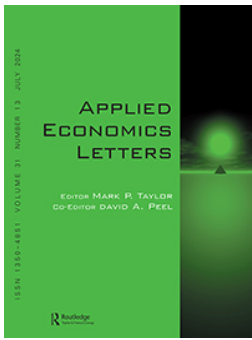
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The spectre of terrorism and the stock market

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ABSTRACT

Terrorism is a major issue in the twenty-first century. In this paper, we examine the effect of terrorism on the stock market. We go beyond previous studies to explore the spectre of terrorism on the market rather than terrorist activities. Using a narrative-based approach à la Shiller (2019), we find that the spectre of terrorism during the Northern Ireland Troubles reduced returns and increased volatility in the UK stock market.

Highlights

- The threat of terrorism affects stock market returns
- Media narratives can approximate the threat of terrorism
- Terrorism narratives reduce stock market returns and increase volatility
- The effect of terrorism narratives persists when controlling for terrorism events

JEL CLASSIFICATION

C00; E44; G12; G40; N24

KEYWORDS

Terrorism; stock market; returns; volatility; narratives

I. Introduction

Terrorism has become a major concern for societies across the globe over the past two decades. As a result, there is a growing literature on the effect of terrorism on stock markets (Arin, Ciferri, and Spagnolo 2008; Chesney, Reshetar, and Karaman 2011; Eldor and Melnick 2004; Karolyi and Martell 2006; Markoulis and Katsikides 2020; Nikkinen and Vähämaa 2010). This literature uses one of the two methods to explore the relationship between terrorism and the stock market. Some studies take an event-study approach and analyse the effect of major terrorist atrocities, such as 9/11, on abnormal returns, whilst others examine the effect of terrorist events (small and large) on a time series of various stock market indices. But an absence of major terrorist atrocities and events does not imply an absence of terror. Such measures do not capture protests, riots by terrorist supporters, political talks to address a conflict, breakdown of talks, boycotts, and prison protests by terrorists. They also miss the spectre of terrorism. In other words, there can be no terrorist events, but a real sense of heightened fear.



Inspired by Shiller (2019), we propose capturing the spectre of terrorism using narratives. Narratives are human constructs that contain fact, emotions,

and human interest that form an impression on how we think and act (Shiller 2019). We use quantitative narrative analysis of newspaper reporting to measure terror. Specifically, we use the *Financial Times'* narratives on the Northern Ireland Troubles (NIT) which affected the UK from 1969 until 1998. During this conflict, there were 3,720 fatalities, over 47,000 people injured, nearly 37,000 shootings, and over 16,000 bombings. No other OECD economy has experienced such a prolonged period of domestic terrorism in the past 70 years.

We analyse the effect of these narratives on the NIT on the daily returns and volatility of the UK stock market. We find on days where opinion articles have a strong terror narrative, returns are 10.77 basis points lower than average on the stock market, and that terror narratives increase conditional volatility in the stock market nearly twice as much as terrorist activities. These results are consistent with an emotional reaction to the terror narrative (Wang and Young 2020).

II. Data and methods

We capture the terror narrative presented to investors by using the opinion sections of the *Financial*

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Times (FT). Using opinion sections allows a clearer distinction between narratives and events. The first step in measuring the terrorism narrative was to pre-process the articles by removing irrelevant information such as numbers, punctuation, special characters, words two letters and under, stop words, and words that appear less than 25 times. Words were stemmed using Porter's algorithm (Van Rijsbergen, Robertson, and Porter 1980). Bigrams and trigrams with socioeconomic meaning (e.g. 'European monetary system') were concatenated.

The second step filtered all 94,984 opinion articles published in the FT from 1969 to 1998 for references to Ireland. We searched for *Ireland, Irish, Eire, Northern Ireland, Belfast*, the four provinces and 32 counties of Ireland.¹ This identifies 33,543 references in 13,162 different articles.

The final step utilized the Correlated Topic Model (CTM) of Blei and Lafferty (2005). CTM requires the modeller to select the number of topics to identify. While the NIT was the main Irish issue commented upon by the FT from 1969 to 1998, it was not the only one. Using three topics best identifies NIT coverage. Whereas increasing the number of topics from two to three improves the semantic cohesion of the model by 13.48%, increasing the number of topics to four reduces the semantic cohesion by 12.20%. Manual inspection

of model output confirms the trend. Table 1 displays the most frequent words for the identified topics labelled *Economy, Terror, and Europe* according to their content.

CTM measures article's proportion related to each topic. We use the average daily terror topic proportion concerning to approximate the terror narrative in subsequent regression analysis. For descriptive purposes, we identify terrorism articles as the top quartile of terror topic scores.

We use data on terrorist acts associated with NIT as a control and comparison with the terror narrative presented in the FT. Terrorism data are sourced from the [Global Terrorism Database](#) for the period 1970 to 1998, excluding 1993. We identify events, injuries and fatalities in the UK and Ireland from 1969 to 1998 linked to NIT-affiliated terrorist organizations. Our terror narrative exhibits minimal correlation with terrorism activity. Among the 10 most fatal days during the NIT, only three instances saw a subsequent opinion article referencing Ireland. Two of these articles contained strong terror narratives, comprising 88% of the content, while the third focused mainly on Europe with just 1% related to terror. The terror narrative peaks in 1972, the fourth year of the NIT, with 35 opinion articles in the top quartile of terror topic scores. Subsequently, the number of articles declines until the mid-1990s, with the final year of

Table 1. Irish topics in the *Financial Times* 1969–1998.

Topic 1	Topic 2	Topic 3
Economy	Terror	Europe
Profit	IRA	Fair
Earn	Unionist	Country
Index	Violence	Unemployment
Share price	Catholic	European
Shareholder	Peace	EEC
Sale	Ulster	Europe
Bid	Protest	Commission
Bank	Northern Ireland	Budget
Dividend	Party	Nation
Column	Province	Franc
Cash	Terrorist	Economy
Pre-tax	Dublin	Community
Company	Ceasefire	Germany
Yield	Belfast	Brussels
Stock	Constitution	Region
Investor	Talk	World
Quarter	Lynch	EMU
Acquisition	Police	French
Pre-tax profit	Elect	German

¹Search terms are also stemmed. 'County Down' is used rather than 'Down' and both *Derry* and *Londonderry* are included.

the NIT seeing 25 opinion pieces, the third-largest annual count.

III. Results and discussion

To assess the effect of the terror narratives on the stock market, we use the FT30, the United Kingdom's oldest daily stock index. We calculate the conditional volatility of returns using a GARCH(1,1) of the series. Table 2 shows the average return over the 7,591 trading days from 1969 to 1998 was 2.49 basis points. On the 284 trading days where there was an FT article in the top quartile of the terror topic, the average return was -10.77 basis points. On the 242 trading days in the bottom quartile, the average return was 1.29 basis points. This contrasts with the market response to deaths associated with NIT: the average return is 5.21 basis points on the day of deaths and 4.28 basis points the next day. Consistent with previous literature, the conditional volatility of returns is higher on days with terrorist activity. However, it is only marginally higher on days with FT narrative on the terror topic.

Table 3 shows the relationship between the terror narrative and subsequent market performance. Results are reported based on 7,590 observations and reported with robust standard errors. Panel A reports β coefficients and t -stats from the model

$$R_t = \alpha + \beta(T_{t-1}) + \eta R_{t-1} + \psi \text{Jan} + \varepsilon_t \quad (1)$$

where R_t is FT30 log returns, Jan is a month-of-the-year dummy, and T_{t-1} is our terror measures. The Terror Narrative is the daily average proportion of coverage about the NIT as identified using the CTM. Following García (2013) and Hanna et al. (2020), we date our narrative measures to the day written rather than the day published because the

content of the morning paper is written the day before. The Long-Run Terror Narrative is a 120-day moving average of the Terror Narrative variable. Following Arin, Ciferri and Spagnolo (2008), the Terrorism Activity Index is the natural log of (e + number of events + number of wounded + number of fatalities).

Panel A of Table 3 shows that the terrorist acts associated with the NIT did not affect stock returns. While terrorism did not affect returns, the spectre of terrorism did. Both the previous day's Terror Narrative and Long-Run Terror Narrative negatively correlate with subsequent returns: a one standard deviation change is associated with a 0.027 and 0.024 basis point reduction, respectively. These effects persist after controlling for the Terrorism Activity Index. Panel B and C show that only Long Run Terror Narratives correlates with subsequent five or twenty-day returns, suggesting short-run terror narratives have a short-run effect on returns, whereas longer-run narratives have a longer-run effect on returns. This aligns with sentiment trading theories, such as Tetlock (2007), where previous-day newspaper sentiment correlates with the next day's returns, but the effect is reversed over subsequent days. A narrative spread over the preceding 120-days creates a more foreboding spectre than one created over the previous day which may be more easily forgotten.

Panel D reports β coefficients and p-values from the model

$$\sigma_t = \alpha + \beta(T_{t-1}) + \varepsilon_t \quad (2)$$

where σ_t is the conditional variance of FT30 log returns as calculated by a GARCH(1,1) model.

Table 2. Descriptive statistics.

		Obs.	Mean	Median	St. Dev	Min	Max
Panel A: All Days (10,956 days)							
Returns	Basis Points	7,591	2.49	2.81	120.61	-1,240.02	961.86
Volatility		7,591	1.45	1.00	1.68	0.34	20.81
Terror Articles	No.	299	1.05	1	0.24	1	3
NIT Deaths	No.	1,795	1.68	1	1.90	1	33
Panel B: Terror Article Days (299 days)							
Returns		284	-10.77	-12.28	135.18	-692.58	412.47
Volatility		284	1.46	1.03	1.39	0.39	12.07
Panel C: NIT Deaths Days (1,781 days)							
Returns		1,257	5.21	4.15	131.40	-629.80	717.41
Next-Day Returns		1,208	4.28	0.00	141.96	-736.98	717.41
Volatility		1,257	1.82	1.17	2.07	0.38	19.28
Next-Day Volatility		1,208	1.86	1.18	2.10	0.37	19.50

Table 3. Spectre of terror, terrorist activity and the stock market.

	Panel A: Next Day Returns				
	(1)	(2)	(3)	(4)	(5)
<i>Terror Narrative</i>	-0.027** (-2.07)			-0.027** (-2.00)	
<i>Long-Run Terror Narrative</i>		-0.024** (-2.01)			-0.024** (-2.02)
<i>Terrorism Activity Index</i>			-0.005 (-0.46)	0.004 (0.35)	-0.005 (-0.41)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes
	Panel B: Next Week Returns				
	(6)	(7)	(8)	(9)	(10)
<i>Terror Narrative</i>	-0.022 (-1.62)			-0.021 (-1.61)	
<i>Long-Run Terror Narrative</i>		-0.051*** (-4.41)			-0.051*** (-4.41)
<i>Terrorism Activity Index</i>			-0.004 (-0.36)	-0.004 (-3.67)	-0.003 (-0.30)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes
	Panel C: Next Month Returns				
	(11)	(12)	(13)	(14)	(15)
<i>Terror Narrative</i>	-0.006 (-0.46)			-0.006 (-0.46)	
<i>Long-Run Terror Narrative</i>		-0.091*** (-7.87)			-0.091*** (-7.84)
<i>Terrorism Activity Index</i>			-0.006 (-0.64)	-0.005 (-0.47)	-0.003 (-0.27)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes
	Panel D: Next Day Volatility				
	(16)	(17)	(18)	(19)	(20)
<i>Terror Narrative</i>	-0.002 (-0.24)			-0.004 (-0.45)	
<i>Long-Run Terror Narrative</i>		0.072*** (7.64)			0.071*** (7.52)
<i>Terrorism Activity Index</i>			0.044*** (3.96)	0.044*** (3.96)	0.042*** (3.82)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	No	No	No	No	No
	Panel E: Next Month Volatility				
	(21)	(22)	(23)	(24)	(25)
<i>Terror Narrative</i>	0.011 (0.92)			0.010 (0.72)	
<i>Long-Run Terror Narrative</i>		0.093*** (8.16)			0.092*** (8.03)
<i>Terrorism Activity Index</i>			0.053*** (4.75)	0.053*** (4.67)	0.051*** (4.58)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes

Panel D shows terrorist activity and the spectre of terror increased market volatility. A one standard deviation increase in the Terrorism Activity Index associates with a 0.044 increase in FT30 volatility compared to a 0.072 increase for Long-Run Terror Narratives. When both are included in

the model, their effects persist, suggesting that the spectre of terror does not proxy terrorist activity, but another factor that affects the market.

To test the ongoing impact of Terror Narratives on volatility, we use future realized volatility based on a rolling 20-day ahead standard deviation of

returns. Panel E shows that Long-Run Terror Narratives correlate with volatility over the subsequent 20-days but no apparent relationship exists between Terror Narratives and subsequent volatility at one-day or 20-day frequencies. These findings also suggest that longer-run narratives create a more foreboding spectre than one created over the previous day.

Given the relative sparse nature of FT commentary on the NIT, as an additional robustness test, we limit regression analysis to the 1,006 days with non-zero coverage of the Troubles. Results in Appendix Table A1 show that our terror narrative is negatively correlated with subsequent returns and positively correlated with conditional volatility even when controlling for terrorism activity. Results are also robust to the exclusion of outlier days with the findings qualitatively unchanged when terror narratives are winsorized at the 95 quantiles.

IV. Conclusion

Using newspaper narratives on terrorism during the NIT, we find that the spectre of terrorism decreases returns on the UK stock market and increases volatility. Even when we control for terrorist activity, this effect remains. Our findings are consistent with an emotional reaction by investors to the terror narrative (Wang and Young 2020). One of the main implications of our results is that the spectre of terror can have just as large an effect on the economy as actual terrorist events.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix

Table A1. Spectre of terror, terrorist activity and the stock market: days with coverage about the Northern Ireland troubles.

	Panel A: Next Day Returns				
	(1)	(2)	(3)	(4)	(5)
<i>Terror Narrative</i>	-0.066** (-1.99)			-0.066** (-1.97)	
<i>Long-Run Terror Narrative</i>		-0.028 (-0.94)			-0.028 (-0.93)
<i>Terrorism Activity Index</i>			-0.008 (-0.25)	-0.003 (-0.10)	-0.097 (-0.21)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes
	Panel B: Next Month Returns				
	(6)	(7)	(8)	(9)	(10)
<i>Terror Narrative</i>	-0.010 (-0.30)			-0.011 (-0.32)	
<i>Long-Run Terror Narrative</i>		-0.096*** (-2.94)			-0.096*** (-2.97)
<i>Terrorism Activity Index</i>			0.011 (0.38)	0.012 (0.41)	0.015 (0.56)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes
	Panel C: Next Day Volatility				
	(11)	(12)	(13)	(14)	(15)
<i>Terror Narrative</i>	0.006 (0.23)			0.005 (0.18)	
<i>Long-Run Terror Narrative</i>		0.061*** (2.89)			0.060*** (2.85)
<i>Terrorism Activity Index</i>			0.016 (0.62)	0.016 (0.60)	0.014 (0.52)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	No	No	No	No	No
	Panel D: Next Month Volatility				
	(16)	(17)	(18)	(19)	(20)
<i>Terror Narrative</i>	0.085*** (2.64)			0.084** (2.57)	
<i>Long-Run Terror Narrative</i>		0.072** (2.57)			0.071** (2.54)
<i>Terrorism Activity Index</i>			0.022 (0.85)	0.015 (0.59)	0.018 (0.73)
<i>Constant</i>	Yes	Yes	Yes	Yes	Yes
<i>AR(1) and Jan Dummy</i>	Yes	Yes	Yes	Yes	Yes